LAWRENCE LIVERMORE
REPORT

A weekly collection of scientific and technological achievements from Lawrence Livermore National Laboratory, May 3-10, 2010

Supercool supercomputers

Kim Cupps and Mark Seager inspect a newly installed rack for Dawn, which will help lay the foundation for the Sequoia system.

From understanding earthquakes to mapping the bloodstream, supercomputers are here to stay.

They fill enormous rooms, which are chilled to prevent their thousands of microprocessor cores from overheating. And they perform trillions, or even thousands of trillions, of calculations per second.

And since 1992 when the U.S. banned the testing of nuclear weapons, Lawrence Livermore supercomputers ensure that the nuclear arsenal is not out of date.

The Stockpile Stewardship program uses non-nuclear lab tests and computer simulations to ensure that the country's cache of nuclear weapons are functional and safe. In 2012, IBM plans to unveil a new supercomputer, Sequoia, at LLNL. Sequoia will be a 20-petaFLOP (floating operations per second) machine, meaning it will be capable of performing 20,000 trillion calculations each second.

For more, go to http://www.livescience.com/technology/Super-Cool-Uses-for-Supercomputers-100430.html

Three inches of detection

LLNL biologist Crystal Jaing is shown loading a fluorescently labeled viral DNA sample onto the Lawrence Livermore Microbial Detection Array.

A novel three-inch device created at the Laboratory can quickly detect and identify viruses or bacteria in fields ranging from anti-terrorism to medical diagnosis. The new detector can identify any of 3,000 different viruses or bacteria in just 24 hours.

The Lawrence Livermore Microbial Detection Array (LLMDA) is a one-inch wide, three-inch long glass slide, but packed in a checkerboard pattern within the device are 388,000 probes set to detect more than 2,000 viruses and about 900 bacteria.

Each bacteria or virus that has been sequenced and included in the LLMDA has several dozen probes on board seeking out the telltale signs of that particular agent. And because each probe is individually sequenced, the device also can detect multiple pathogens in the same sample, an upgrade from current multiplex polymerase chain reaction methods that, at the high end, can detect a maximum of 50 or so pathogens in a single test.

For more, go to http://www.popsci.com/science/article/2010-05/three-inch-bio-detector-scans-all-bacteria-and-viruses-we-know-all-once

The earth does not move by quakes alone

Views of the city of Pisco, Peru following the Aug. 15, 2007 magnitude 8.0 earthquake.

Just a few years ago, Dan Farber happened to be doing field work in Peru with students when the 8.0 Pisco earthquake struck.

As a scientist working in the active tectonics of the Peruvian Andes -- funded through the Lab's Institute for Geophysics and Planetary Physics -- Farber was asked by colleagues if he could participate in a rapid response team to map the damage of the seismic deformation and install a system of geodetic stations.

In a new paper appearing in the May 6 edition of the journal, *Nature*, Farber and international colleagues determined that seismic slip on one of the Earth's largest subduction zones – the Central Peru Megathrust -- is not dependent on earthquakes alone. As it turns out, movement along this subduction zone is caused by earthquakes as well as non-seismic (aseismic) related slip from steady or transient creep between or directly after earthquakes.

For more, go to http://www.sciencedaily.com/releases/2010/05/100506131642.htm

Getting to the bottom of the periodic table

Lab researchers along with an international team has heralded a new addition -- element 117 -- to the periodic table.

By smashing atoms of calcium ions, (which have an atomic number of 20) into an atom of berkelium (atomic number 97), the team came up with element 117. Twenty plus 97 equals 117. The unnamed element will be verified by an independent team before it is named.

The research was recently featured on MSNBC's Rachel Maddow Show. To watch the feature, go to http://www.msnbc.msn.com/id/26315908/#36294902

Firing up the world's largest laser

Scientists are using the world's largest laser in the Lab's National Ignition Facility to build a star on Earth.

The laser is roughly the size of three American football fields, and it's no joke to the scientists working there, that they will create a tiny sun in the next few months.

It's all about finding the mecca of energy production -- nuclear fusion, a high-energy reaction that would theoretically provide limitless energy for humanity.

Ignition experiments are set to start later this year.

To read more, go to http://www.foxnews.com/scitech/2010/04/29/worlds-largest-laser-livermore-fusion/

Latest *Newsline* available

Newsline provides the latest Lab research and operations news. See the most recent issue at https://newsline.llnl.gov

Photo of the week

The hills are alive: Blue skies peek through billowing clouds over the Livermore foothills. The Laboratory is in the foreground.

LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance.

To send input to the Livermore Lab Report, send e-mail mailto:labreport@llnl.gov.

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